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U. S. Department of Transportation
Docket Management System
1200 New Jersey Ave., SE,
Washington, DC 20590

Subject: Pyka Inc. Petition for Exemption Pursuant to 49 U.S.C. 44807 and 14 C.F.R. Part 11 to Authorize Commercial Agricultural-Related Services with the Pyka P-400b UAS

To Whom it May Concern:

Pursuant to 49 U.S.C. 44807 and 14 C.F.R. Part 11, Pyka Inc. ("Pyka"), by and through undersigned counsel, hereby applies for a Grant of Exemption from the Federal Aviation Regulations (“FARs”) identified below to allow Pyka to operate its proprietary P-400b UAS, which is a fixed-wing aircraft that has a maximum takeoff weight of 600 pounds, for aerial agricultural spraying operations in remote rural operating environments.

The proposed operations in this Petition for Exemption are similar to the agricultural operations conducted by DroneSeed Co. in Exemption No. 17936 (“the DroneSeed Exemption”) and Yamaha Motor Corporation, USA in Exemption No. 11448 (“the Yamaha Exemption”).

In support of this Petition for Exemption, Pyka will submit the following associated UAS operating documents:

- Pyka Concept of Operations (“CONOPS”);
- Pyka P-400b Flight Manual;
- Pyka P-400b Maintenance Manual;
- Pyka P-400b Aircraft Design Loads;

- Pyka P-400b Load Testing Cards;
- Pyka P-400b Type Design Compliance Written Analysis;
- Pyka P-400b Type Design Acceptance Requirements;
- Pyka P-400b Endurance Test Plan
- Pyka Training Program; and
- Pyka Operational Risk Assessment

These documents will be submitted on a confidential basis under separate cover pursuant to 14 C.F.R. § 11.35(b), as the documents contain confidential commercial and proprietary information that Pyka has not and will not share with others. The information contained in this material is not generally available to the public and is protected from release under the Freedom of Information Act, 5 U.S.C. § 552 *et seq*.

I. BACKGROUND OF PETITIONER AND DESCRIPTION OF PROPOSED UAS OPERATIONS

Pyka is an integrated unmanned electric airplane design, development, and operations company located in Oakland, California, which manufacturers and operates the P-400b UAS—a large fixed-wing UAS used for agricultural aerial spraying operations in remote rural environments.

Pyka was founded in 2017 and provides aerial agricultural spray services for clients using unmanned, automated electric aircraft. The company currently utilizes its P-400b platform to provide these services and has designed its system to deliver precision spray services to its clients. Pyka's technical team is comprised of engineers, roboticists, and aerospace professionals with backgrounds in electric aircraft and autonomous system development, reliability testing, and fleet operations.

Pyka is currently performing flight testing and agricultural operations in collaboration with the New Zealand Civil Authority (New Zealand CAA) under a New Zealand CAA Unmanned Aircraft Operator's Certificate. Pyka has since flown its P-400b system more than 3,700 miles safely under that authorization and completed an extensive airworthiness and flight test program for the system. In addition, Pyka has worked with industry partners, regulators, and accredited training organizations to develop fault-tolerant safety features for the P-400b and to establish appropriate aviation safety procedures in its operations. In addition, Pyka is collaborating with the Nevada Institute for Autonomous Systems ("NIAS") to test its system in the United States, under a Certificate of Authorization ("COA").

In accordance with 14 C.F.R. § 11.81(a), the contact information for Petitioner is as follows:

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II. DESCRIPTION OF UAS

The Pyka P-400b is a three-motor, electric-powered, propeller driven UAS. The aircraft is configured with three 8 kW continuous electric motors, one on each wing and one forward of the horizontal stabilizer, which is mounted atop the vertical fin. The motors drive fixed pitch propellers. The maximum gross takeoff weight is 600 pounds. The aircraft's structure is primarily carbon composite and the landing gear structure is metallic (aluminum, steel, and titanium). The aircraft measures approximately 15.75 feet (4.8 M) in length and has a wingspan length of approximately 25.6 feet (7.8 M). The aircraft is powered by a pair of redundant 53.2 V (nominal) lithium polymer batteries. Additional proprietary details regarding the design and operation of the Pyka P-400b are located in the Pyka P-400b Flight Manual and submitted under separate cover via email.

III. REGULATIONS FROM WHICH EXEMPTION IS SOUGHT

Pyka seeks an exemption from the following interrelated provisions of 14 C.F.R. Parts 61, 91 and 137:

FAR	Description
§ 61.3(a)(1)(i)	**Requirement for certificates, ratings, and authorizations.**
§ 91.7(a)	**Civil aircraft airworthiness.**
§ 91.119(c)	**Minimum safe altitudes: General.**
§ 91.121	**Altimeter settings.**
§ 91.151(b)	**Fuel requirements for flight in VFR conditions.**
§ 91.405(a)	**Maintenance required.**

§ 91.407(a)(1)	**Operation after maintenance, preventive maintenance, rebuilding, and inspections.**
§ 91.409(a)(1) and (2)	**Inspections.**
§ 91.417(a) and (b)	**Maintenance records.**
§ 137.19 (c), (d) and (e)(2)(ii)(iii) and (v)	**Certification requirements**
§ 137.31	**Aircraft requirements**
§ 137.33	**Carrying of certificate**
§ 137.41(c)	**Personnel, Pilot in command**
§ 137.42	**Fastening of safety belts and shoulder harnesses**

Listed below are the specific Federal Aviation Regulations ("FARs") sections from which an exemption is sought, the rationale for why an exemption is needed, and a brief summary of the operating procedures and safeguards, which are described more fully in the operating documents being submitted under separate cover, which will ensure that the proposed operations can be conducted at a level of safety that is at least equal to that provided by the rule from which exemption is sought. For ease of review, this section divides the FARs from which exemption is sought into four main categories: (1) FARs pertaining to the UAS; (2) FARs pertaining to UAS Operating Parameters, and; (3) FARs pertaining to Part 137 Operating Parameters.

To expedite the FAA's safety assessment of the proposed UAS operations, except where explicitly noted, Pyka agrees to conduct the proposed operations in accordance with the same applicable conditions and limitations ("Limitations") included in the Yamaha Exemption.

Two distinctions from the Limitations in the Yamaha Exemption relate to the use of a visual observer ("VO") and the maximum UA operating airspeed. The Yamaha Exemption required the use of a VO and included a maximum operating airspeed of 45 mph. Pyka proposes conducting the proposed operations with a pilot and separate ground control station operator, rather than requiring the use of a dedicated VO. Given that the P-400b is a fixed-wing aircraft rather than a rotorcraft, as was the case in the Yamaha Exemption, the safe and effective operation of the aircraft requires flying at higher airspeeds. Pyka proposes operating at cruise speed of 70 mph, with a maximum operating airspeed of 90 mph. As discussed in the operating documents submitted under separate cover, the highly automated nature of the operation and minimal pilot workload during operations will enable the operations to be conducted safely without the use of a dedicated VO and at the proposed operating airspeeds.

A. FARs Pertaining to the Unmanned Aircraft System

§ 91.405(a) *Maintenance required*
§ 91.407(a)(1) *Operation after maintenance, preventive maintenance, rebuilding, or alteration*
§ 91.409(a)(1) and (2) *Inspections*
§ 91.417(a) and (b) *Maintenance records*.

Pyka seeks an exemption from the following maintenance and inspection-related FARs: §§ 91.405(a) *Maintenance required*, 91.407(a)(1) *Operation after maintenance, preventive maintenance, rebuilding, or alteration*, 91.409(a)(1) and (2) *Inspections*, and 91.417(a) and (b) *Maintenance records*. These regulations specify maintenance, inspection, and records standards in reference to FAR § 43.6. An exemption from these regulations is needed because Part 43 and these sections only apply to aircraft with an airworthiness certificate, which the UAS to be operated under this exemption will not have, and because compliance with these regulatory provisions in the context of UAS operations is not feasible.

An equivalent level of safety will be achieved because maintenance, inspections, and records handling will be performed in accordance with the Pyka P-400b Maintenance Manual, and the Yamaha Exemption Limitations. Under the Limitations, for example, the PIC will conduct a pre-flight inspection of the UAS and all associated equipment to account for all discrepancies and/or inoperable components. Maintenance will be performed and verified to address any conditions potentially affecting the safe operation of the UAS, and no flights will occur unless and until all flight critical components of the UAS have been found to be airworthy and in a condition for safe operation. A functional test flight will also be conducted in a controlled environment following the replacement of any flight critical components, and, as required by the operating documents, the PIC who conducts the functional test flight will make an entry in the UAS aircraft records of the flight. In addition, Pyka will comply with the maintenance, overhaul, replacement, inspection, and life limit requirements for the UAS and its components as described in the P-400b Maintenance Manual. In conjunction with the operational safeguards in the P-400b Flight Manual, the routine maintenance and inspection requirements provide an equivalent level of safety to the above-references maintenance and inspection FARs.

In the Yamaha Exemption, the FAA determined that the proposed UAS operations required exemption from FAR §§ 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b), and that the achievement of an adequate level of safety required certain conditions and limitations. Pyka has proposed in this Petition a number of Limitations related to maintenance, inspections, and records which it believes provide a level of safety at least equivalent to that

provided by FAR §§ 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b). For this reason, and consistent with the exemption granted from these sections in the Yamaha Exemption, Pyka requests an exemption from these sections subject to the Yamaha Exemption Limitations, without having to perform the inspections and maintenance items required by FAR §§ 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), and 91.417(a) and (b).

B. FARs Pertaining to Unmanned Aircraft System Operating Parameters

§ 91.7(a) Civil aircraft airworthiness

Inasmuch as there will be no airworthiness certificate issued for the UAS, Pyka seeks an exemption from FAR § 91.7(a) *Civil aircraft airworthiness*, which requires that a civil aircraft be in an airworthy condition to be operated. While the UAS operated by Pyka will not have an airworthiness certificate, consistent with the FAA's determination in the Yamaha Exemption, the pilot may determine the UA is in an airworthy condition prior to flight. As described more fully in the operating documents, this is achieved through adherence to the maintenance and inspection procedures in the Pyka P-400b Maintenance Manual submitted under separate cover.

§ 91.119(c) Minimum safe altitudes

Pyka also seeks an exemption from FAR § 91.119(c) *Minimum safe altitudes*, to the extent necessary to allow UAS operations over *other than congested areas* at altitudes lower than those permitted by rule. The ability to operate at those altitudes is one of the key benefits of using UAS for the proposed agricultural activities. An equivalent or greater level of safety will be achieved given the remote, rural and controlled agricultural locations where the proposed operations will occur.

As described in the operating documents, Pyka generally tries to maintain an operating altitude below 300 ft AGL during its spraying operations. In the extremely remote and secure environment where Pyka operations occur, flying at a low altitude increases the aircraft's efficiency, without posing any increased risk to people or property. Even at these low altitudes, Pyka's UAS operations will be conducted at a level of safety equal to or greater than that achieved by a larger manned aircraft performing similar activities at the altitudes required by FAR § 91.119.

§ 91.121 Altimeter settings

Pyka also requests an exemption from FAR § 91.121 *Altimeter settings,* which requires a person operating an aircraft to maintain cruising altitude or flight level by reference to an altimeter that is set to the elevation of the departure airport or barometric pressure. In the Yamaha Exemption, the FAA stated that an equivalent level of safety to the requirements of FAR § 91.121 can be achieved in circumstances where the PIC uses an alternative means for measuring and reporting UA altitude, such as global positioning system (GPS).[1] The Pyka P-400b is equipped with downward facing laser altimeters which are fused with GPS and inertial data by the flight controller to provide a robust means for measuring and reporting UAS altitude, and the PIC will check the UA altitude reading prior to each takeoff, effectively zeroing the UA's altitude at that point. Consistent with previously granted exemptions, these requirements ensure that an equivalent level of safety will be achieved, and an exemption from the requirements of FAR § 91.121 is therefore appropriate.

§ 91.151(b), Fuel requirements for flight in VFR conditions

Finally, Pyka seeks an exemption from FAR § 91.151(b) *Fuel requirements for flight in VFR conditions,* which would otherwise require a 20-minute fuel reserve to be maintained. The FAA has previously determined that a requirement prohibiting the PIC from beginning a UAS flight unless (considering wind and forecast weather conditions) there was enough available power for UAS to operate for the intended operational time and to operate after that for at least five minutes or with the reserve power recommended by the manufacturer if greater would ensure an equivalent level of safety to the fuel requirements of FAR § 91.151. See the Yamaha Exemption at pg. 16. Pyka will adhere to the same reserve power requirement and an exemption from FAR § 91.151's fuel requirements for flight in VFR conditions is therefore appropriate.

C. FARs Pertaining to Part 137 Certification Requirements

Pyka seeks an exemption from the following FARs in Part 137 that it was previously granted an exemption to in the DroneSeed Exemption: §§ 137.19(c), (d) and (e)(2)(ii)(iii) and (v) *Certification requirements*, 137.31 *Aircraft requirements*, 137.33 *Carrying of certificate*, 137.41(c) *Personnel*, and 137.42 *Fastening of safety belts and shoulder harnesses*. An exemption from these FARs is necessary because the provisions are either not compatible with or are unnecessary in the context of the proposed UAS operations.

[1] See the Yamaha Exemption at pg. 16.

§ 137.19(c) Certification requirements
§ 61.3(a)(1)(i) Requirement for certificates, ratings, and authorizations

Pyka requests an exemption from FAR § 137.19(c) to the extent necessary to permit persons holding a remote PIC certificate with small UAS rating to act as PIC for commercial agricultural aircraft operations when utilizing a UAS to conduct the operations. Consistent with prior exemptions issued by the FAA, an equivalent level of safety will be maintained by requiring pilots to comply with the additional knowledge and applicable skill requirements in Part 137, as well as the Pyka's UAS-specific pilot training requirements in the Pyka Pilot Training Program. Additionally, since the proposed operations will be conducted under Part 91 (rather than Part 107) and because Part 91 is predicated on the presumption that the PIC holds an airman certificate under Part 61, an exemption from the requirement in FAR § 61.3(a)(1)(i) that the PIC holds a pilot certificate issued under Part 61 is necessary.

§ 137.19(d) Certification requirements
§ 137.31(a) *Aircraft requirements*

FAR § 137.19(d) states the applicant for an agricultural aircraft operator certificate must have at least one certificated and airworthy aircraft, equipped for agricultural operation. Relief from this provision is necessary because the Pyka P-400b will not have an airworthiness certificate. Consistent with prior FAA analysis in other exemptions authorizing Part 137 agricultural operations involving UAS over 55 pounds, Pyka will be capable of ensuring that the UAS are in a condition for safe operation based upon a thorough pre-flight inspection and compliance with the operating documents. FAR § 137.31(a) *Aircraft requirements*, requires aircraft operated under Part 137 to meet the requirements of FAR § 137.19(d) and therefore an exemption will be required from this interrelated provision.

§ 137.19(e)(2)(ii), (iii), and (v) *Certification requirements*
§ 137.41(c) *Personnel*

Pyka seeks an exemption from the knowledge and skill test requirements in FAR § 137.19(e)(2)(ii), (iii), and (v) *Certification requirements*, because those requirements are not compatible or applicable to Pyka's proposed UAS operations. Consistent with the FAA's analysis in the DroneSeed Exemption, demonstration of the skill described in these paragraphs is not necessary because they are not compatible with the operation of the Pyka P-400b during the proposed agricultural aircraft operations. Pyka's pilot training requirements contained in the Pyka Pilot Training Manual will provide pilots with the necessary skills to operate the Pyka P-400b safely in agricultural aircraft operations. For this reason, granting relief from a

demonstration of the skills described in FAR § 137.19(e)(2)(ii), (iii), and (v) does not adversely impact safety because the operations of the Pyka P-400b would not include any exercise of those maneuvers. Additionally, Pyka's pilots will need to demonstrate all other skill requirements in FAR § 137.19(e)(2) from which an exemption is not being sought, as required for certification as an agricultural aircraft operator under Part 137.

For the same reasons referenced above, Pyka also seeks an exemption from the pilot certificate requirements of FAR § 137.41(c), *Personnel*, as § 137.41(c) prohibits any person from acting as pilot in command of an aircraft unless that person holds a pilot certificate and rating prescribed by § 137.19(b) or (c), as appropriate for the type of operation conducted. Section 137.41(c) further requires the pilot in command to fulfill the knowledge and skill requirements of § 137.19(e). Pyka seeks relief from § 137.41(c) to the extent necessary to require a remote pilot in command certificate for the proposed agricultural operations in this petition for exemption.

§ 137.31(b) Aircraft requirements
§ 137.42 Fastening of safety belts and shoulder harnesses

Pyka seeks an exemption from FARs § 137.31(b) *Aircraft requirements,* and § 137.42 *Fastening of safety belts and shoulder harnesses,* which relate to the installation and use of a shoulder harness and safety belt on an aircraft. An exemption from these requirements is warranted because the Pyka P-400b does not have an onboard pilot and these regulations are intended to ensure the safety of the onboard pilot during manned agricultural aircraft operations. For this reason, granting the requested relief from FARs §§ 137.31(b) and 137.42 in appropriate and will not adversely impact safety.

§ 137.33(a) and (b) Carrying of certificate

Pyka requests relief from FAR § 137.33(a) *Carrying of certificate*, which requires that a facsimile of the agricultural aircraft operator certificate be carried on the aircraft. The FAA has previously determined that relief from FARs §§ 91.9(b)(2) and 91.203(a) and (b) for the carriage of the aircraft flight manual and aircraft registration onboard the aircraft is not necessary. Consistent with the FAA's prior analysis in the DroneSeed Exemption, an exemption is warranted here provided that a facsimile of the agricultural aircraft operator certificate and all certificates of registration are kept in a location accessible to the remote PIC. Finally, given that Pyka P-400b will not have an airworthiness certificate, relief from FAR § 137.33(b) *Carrying of certificate,* which requires the airworthiness certificate (if not carried in the aircraft) be kept available for inspection at the base of dispensing operation is conducted, is necessary. Pyka will keep registration certificates available for inspection.

* * *

Pyka has attempted to identify the appropriate FARs from which an exemption is needed in order to conduct the proposed operations in this Petition for Exemption. To the extent that the FAA determines that Pyka needs an exemption from other FARs which are not addressed or explicitly named in order to conduct the proposed operations, Pyka also seeks an exemption from those FARs for the reasons outlined above.

IV. PUBLIC INTEREST

1. Pyka's intent is to apply fungicides, herbicides, and insecticides at the request of private commercial companies and non-governmental organizations. This process protects crops from biological organisms, pathogens, and weeds that hamper the growth of healthy crops, affecting quality and/or yield. Untreated pests can have irreversible negative effects on crop yields.

2. Agricultural spraying operations by manned aircraft carry significant risks of fatality.[2] This was such a concern that in 2014 the National Transportation and Safety Board commissioned a report to understand root causes. The enhanced safety achieved using UAS, as opposed to the much larger, manned aircraft carrying fuel and crew or passengers, is safer and exposes workers and other people on the ground to significantly less risk.

3. Manned aircraft availability and scheduling are becoming increasingly difficult and costly for Pyka customers. Pilot shortages, aircraft shortages, and driver shortages are increasing. Smaller landowners and non-governmental organizations without several hundred thousand acres are finding it difficult to obtain on time and economical services. Pyka's business serves the public by alleviating pilot and service shortages for small landowners.

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[2] See e.g., NTSB Special Investigative Report on the Safety of Agricultural Aircraft Operations, NTSB/SIR-14/01 (Adopted May 7, 2014):

"78 accidents [and 10 fatalities] occurred during calendar year 2013 and involved some aspect of agricultural (ag) operations, pilot training, or other crop protection activities. The report identifies the following recurring safety issues: lack of ag operations-specific fatigue management guidance, lack of ag operations-specific risk management guidance, inadequate aircraft maintenance, and lack of guidance for pilot knowledge and skills tests."

V. FEDERAL REGISTER SUMMARY

Pursuant to 14 C.F.R. Part 11, the following summary is provided for publication in the FEDERAL REGISTER, should it be determined that publication is needed:

Petitioner seeks an exemption from the following rules in Title 14 of the Code of Federal Regulations:

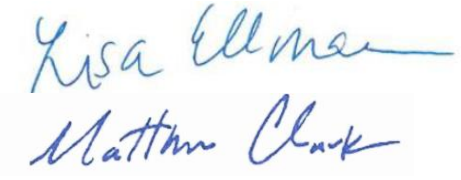
> 61.3(a)(1)(i), 91.7(a), 91.119(c), 91.121, 91.151(b), 91.405(a), 91.407(a)(1), 91.409(a)(1) and (2), 91.417(a) and (b), 137.19 (c), (d) and (e)(2)(ii)(iii) and (v), 137.31, 137.33, 137.41(c), 137.42.

Pyka Inc. is requesting relief to operate the Pyka P-400b unmanned aircraft system in order to provide commercial agricultural-related services in the United States. The Pyka P-400b is a battery-powered fixed-wing aircraft measuring approximately 15.75 feet in length and has a wingspan length of approximately 25.6 feet, with a maximum takeoff weight of 600 pounds. All operations will occur during daylight hours and within visual line-of-sight of a trained pilot in command and a ground controls station operator.

VI. CONCLUSION

For the foregoing reasons, Pyka respectfully requests that the FAA grant this Petition for Exemption. Should you have any questions, or if you need additional information to support Pyka's Petition, please do not hesitate to contact the undersigned.

Respectfully submitted



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